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PATENT



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Tanmoy Dutta, Alexander Balikov,
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Serial No.: Not Yet Assigned

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For: SYSTEM AND METHOD FOR DOCUMENT ISOLATION

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Box ☒ Patent Application
☐ Provisional ☐ Design

Assistant Commissioner for Patents
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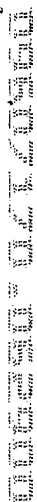
PATENT APPLICATION TRANSMITTAL LETTER

Transmitted herewith for filing, please find

☒ A Utility Patent Application under 37 C.F.R. 1.53(b).

It is a continuing application, as follows:

☐ continuation ☐ divisional ☐ continuation-in-part of prior application number
_____/_____.



- ☐ A Provisional Patent Application under 37 C.F.R. 1.53(c).
- ☐ A Design Patent Application (submitted in duplicate).

Including the following:

- ☐ Provisional Application Cover Sheet.
- ☒ New or Revised Specification, including pages 1 to 48 containing:

☒ Specification

☒ Claims

☒ Abstract

☐ Substitute Specification, including Claims and Abstract.

☐ The present application is a continuation application of Application No. _____ filed _____. The present application includes the Specification of the parent application which has been revised in accordance with the amendments filed in the parent application. Since none of those amendments incorporate new matter into the parent application, the present revised Specification also does not include new matter.

☐ The present application is a continuation application of Application No. _____ filed _____, which in turn is a continuation-in-part of Application No. _____ filed _____. The present application includes the Specification of the parent application which has been revised in accordance with the amendments filed in the parent application. Although the amendments in the parent C-I-P application may have incorporated new matter, since those are the only revisions included in the present application, the present application includes no new matter in relation to the parent application.

☐ A copy of earlier application Serial No. _____ Filed _____, including Specification, Claims and Abstract (pages 1 - @@), to which no new matter has been added TOGETHER WITH a copy of the executed oath or declaration for such earlier application and all drawings and appendices. Such earlier application is hereby incorporated into the present application by reference.

- ☐ Please enter the following amendment to the Specification under the Cross-Reference to Related Applications section (or create such a section) : "This Application:
☐ is a continuation of ☐ is a divisional of ☐ claims benefit of U.S. provisional Application Serial No. _____ filed _____

_____.
- ☐ Signed Statement attached deleting inventor(s) named in the prior application.
- ☐ A Preliminary Amendment.
- ☒ _____ Ten (10) _____ Sheets of ☒ Formal ☐ Informal Drawings.
- ☐ Petition to Accept Photographic Drawings.
- ☐ Petition Fee
- ☒ An ☒ Executed ☐ Unexecuted Declaration or Oath and Power of Attorney.
- ☒ An Associate Power of Attorney.
- ☒ An ☒ Executed ☐ Copy of Executed Assignment of the Invention to _____
_____ Microsoft Corporation _____
- ☒ A Recordation Form Cover Sheet.
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- ☐ The prior application is assigned of record to _____

- ☐ Priority is claimed under 35 U.S.C. § 119 of Patent Application No. _____ filed _____ in _____ (country).
- ☐ A Certified Copy of each of the above applications for which priority is claimed:
- ☐ is enclosed.
- ☐ has been filed in prior application Serial No. _____ filed _____.
- ☐ An ☐ Executed or ☐ Copy of Executed Earlier Statement Claiming Small Entity Status under 37 C.F.R. 1.9 and 1.27
- ☐ is enclosed.
- ☐ has been filed in prior application Serial No. _____ filed _____, said status is still proper and desired in present case.
- ☐ Diskette Containing DNA/Amino Acid Sequence Information.
- ☐ Statement to Support Submission of DNA/Amino Acid Sequence Information.
- ☐ The computer readable form in this application _____, is identical with that filed in Application Serial Number _____, filed _____. In accordance with 37 CFR 1.821(e), please use the ☐ first-filed, ☐ last-filed or ☐ only computer readable form filed in that application as the computer readable form for the instant application. It is understood that the Patent and Trademark Office will make the necessary change in application number and filing date for the computer readable form that will be used for the instant application. A paper copy of the Sequence Listing is ☐ included in the originally-filed specification of the instant application, ☐ included in a separately filed preliminary amendment for incorporation into the specification.
- ☐ Information Disclosure Statement.
- ☐ Attached Form 1449.
- ☐ Copies of each of the references listed on the attached Form PTO-1449 are enclosed herewith.
- ☐ A copy of Petition for Extension of Time as filed in the prior case.
- ☐ Appended Material as follows: _____.

☒ Return Receipt Postcard (should be specifically itemized).

☐ Other as follows: _____

FEE CALCULATION:

☐ Cancel in this application original claims _____ of the prior application before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

				SMALL ENTITY		NOT SMALL ENTITY	
				RATE	FEE	RATE	FEE
PROVISIONAL APPLICATION				\$75.00	\$	\$150.00	\$
DESIGN APPLICATION				\$155.00	\$	\$310.00	\$
UTILITY APPLICATIONS BASE FEE				\$345.00	\$	\$690.00	\$ 690.00
UTILITY APPLICATION; ALL CLAIMS CALCULATED AFTER ENTRY OF ALL AMENDMENTS							
	No. Filed	No. Extra					
TOTAL CLAIMS	20- 20 =	0		\$9 each	\$	\$18 each	\$ 0
INDEP. CLAIMS	3- 3 =	0		\$39 each	\$	\$78 each	\$ 0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				\$130	\$	\$260	\$
ADDITIONAL FILING FEE					\$		\$
TOTAL FILING FEE DUE					\$		\$ 690.00

☒ **Two checks are enclosed: (1) in the amount of \$690.00 for the application filing fee; and (2) in the amount of \$40.00 for the Assignment recordation fee.**

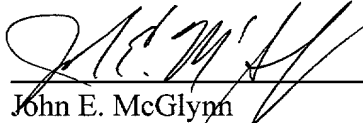
☒ The Commissioner is authorized to charge payment of the following fees and to refund any overpayment associated with this communication or during the pendency of this application to deposit account 23-3050. This sheet is provided in duplicate.

- ☐ The foregoing amount due.
- ☒ Any additional filing fees required, including fees for the presentation of extra claims under 37 C.F.R. 1.16.
- ☒ Any additional patent application processing fees under 37 C.F.R. 1.17 or 1.20(d).
- ☐ The issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance.
- ☒ The Commissioner is hereby requested to grant an extension of time for the appropriate length of time, should one be necessary, in connection with this filing or any future filing submitted to the U.S. Patent and Trademark Office in the above-identified application during the pendency of this application. The Commissioner is further authorized to charge any fees related to any such extension of time to deposit account 23-3050. This sheet is provided in duplicate.

SHOULD ANY DEFICIENCIES APPEAR with respect to this application, including deficiencies in payment of fees, missing parts of the application or otherwise, the United States Patent and Trademark Office is respectfully requested to promptly notify the undersigned.

Date:

June 29, 2000



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SYSTEM AND METHOD FOR DOCUMENT ISOLATION

TECHNICAL FIELD

The present invention relates generally to the field of workflow management systems and, more particularly, to methods and systems for restricting access to documents and operations performed on those documents while being routing through a workflow.

BACKGROUND OF THE INVENTION

Computer based document management systems, which traditionally have provided a mechanism to organize and control access to electronic documents, have been improved to facilitate workflow and document publishing. For example, document management systems now provide the capability to define a workflow template that specifies that a person or set of persons must review or approve a document before the document is made generally available. Such workflow templates are particularly useful in a document publishing environment where approval processes are commonplace.

A particularly important operation in workflow

systems is managing access to documents as they move through various stages of a workflow. In a typical document-publishing scenario, significant time can elapse between creation of a document and final approval of the document for external viewing or publishing. For example, after an author revises an existing document and enters the revised document into a publishing workflow, several editors may need to review the document prior to the document receiving final approval for viewing by people outside the publishing group. It may take an extended period before the editors have an opportunity to review the document. In the meantime, it is necessary to restrict access to the revised document until it receives final approval. Indeed, it is necessary to restrict access to the document even if the editing process takes only short time. Editors should be given access to the new version of the document for purposes of editing and approving the document while those without approval authority should be given access to the original version of the document without revisions. Thus, it can be said that the original or "base" document and the revised document should be maintained separately, or "isolated" from each other and access given as appropriate to one or

the other during the period that the document is undergoing approval in the publishing workflow.

It is also necessary to control access to the publishing operations that may be performed on a document as it is routed through a workflow. For example, while a document may be checked-out for revision numerous times during the course of a workflow, at any given time, however, only specific sets of individuals should have permission to perform this operation.

Thus, there is a need for systems and methods for controlling access to documents and operations to be performed on those documents while documents are routed through a workflow. Specifically, there is a need for systems and methods to "isolate" the base document from the revised document that is undergoing editing in a workflow. Users should selectively be directed to the appropriate version of the document that they are authorized to see. Further, users should selectively be permitted to perform operations on the documents. Preferably, the systems and methods are extensible to accommodate user-defined workflows and workflow operations.

SUMMARY OF THE INVENTION

The present invention is directed toward systems and methods to address these needs. According to an aspect of the invention, when a revision is made to an original or "base" document and the revision placed in a workflow, a separate "working" copy of the base document is generated. As the document moves through the workflow, new versions of the "working" copy document may also be generated. Security controls , which define who may access the base document as well as any versions of the working copy document, are defined and stored in relation to the documents. The security controls further define the types of actions users may take with respect to the document. For example, the security controls may specify that a user should be given access to the working copy document as opposed to the base document and should have the capability to check-out the working copy of the document for revision.

Upon receipt of a request to perform an operation on a document during the period that the document is in the workflow, the security controls are referenced to determine whether the user has permissions to perform the operation as well as to which version of

the document the user should be directed. For example, a user may desire to check-out a document for purposes of editing the document. The security controls associated with the document are referenced to identify to which
5 version of the document the user should be directed as well as to determine whether the particular user may check-out the document for editing.

In an embodiment of the invention, users are assigned roles and document security controls are
10 defined in terms of these roles. For example, in a publishing workflow having an editing state and approval state, users might be assigned one of two different roles, reviewer and approver. During the editing state, the security controls might be defined to provide check-
15 out capabilities to reviewers while denying check-out privileges to approvers. When the document enters the approval state, the security controls are defined to grant approvers check-out privileges while denying the same privileges to reviewers.

20 As will be readily appreciated from the foregoing description, systems and methods in accordance with the invention facilitate controlling access to documents and the operations performed on those documents

during periods when the document is undergoing revision
in a workflow.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Other features of the invention are further
apparent from the following detailed description of
presently preferred exemplary embodiments of the
invention taken in conjunction with the accompanying
drawings, of which:

10 FIGURE 1 is a block diagram of a general
purpose computer system for implementing the present
invention;

 FIGURE 2 is a block diagram illustrating a
network architecture, in accordance with the present
15 invention;

 FIGURE 3 is a block diagram illustrating
representative modules of system software that operate in
accordance with the invention;

 FIGURE 4 is a chart illustrating a workflow
20 that may be facilitated by systems and methods in
accordance with the present invention;

 FIGURE 5 is a table illustrating values for the
access controls that may be maintained for a document as

the document moves through states of a publishing workflow;

FIGURE 6 is a flow diagram of a process for handling a user request to access a document in accordance with the invention;

Figure 7 is a flow diagram of a process for handling a user request to perform a publishing operation on a document in accordance with the present invention;

FIGURE 8 is a flow diagram illustrating the process for resolving whether a user should be granted permission to perform a publishing operation in accordance with the present invention;

FIGURE 9 is an illustrative example of component parts of a security descriptor in accordance with the present invention; and

FIGURE 10 is an illustrative example of component parts of an access control list in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

OVERVIEW

The present invention is directed to novel systems and methods for controlling access to

information, particularly documents. According to an aspect of the invention, when a revision is made to a document and the revision placed in a publishing workflow, a separate "working" copy of the original or "base" document is generated. As the document moves through the workflow, new versions of the "working" copy document may also be generated. Security controls, which are used to identify who may access the base document as well as to determine which version of the working copy document a user should be directed to if one exists, are defined and stored in relation to the documents. The security controls further define the types of actions users may take with respect to the document. For example, the security controls may be used in combination with information regarding the state of the document and the role of the user to identify that a user should be given access to the working copy document and should have the capability to check-out the working copy of the document for revision.

Prior to explaining the details of the invention, it is useful to provide a description of a suitable exemplary environment in which the invention may be implemented.

EXEMPLARY OPERATING ENVIRONMENT

1. A Computer Environment

Figure 1 and the following discussion are intended to provide a brief general description of a suitable computing environment in which the invention may be implemented. Although not required, the invention will be described in the general context of computer-executable instructions, such as program modules, being executed by a computer, such as a workstation or server. Generally, program modules include routines, programs, objects, components, data structures and the like that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the invention may be practiced with other computer system configurations, including hand-held devices, multi-processor systems, microprocessor-based or programmable consumer electronics, network PCS, minicomputers, mainframe computers and the like. The invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a

communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

With reference to Figure 1, an exemplary system
5 for implementing the invention includes a general purpose computing device in the form of a conventional personal computer 20 or the like, including a processing unit 21, a system memory 22, and a system bus 23 that couples various system components including the system memory to
10 the processing unit 21. The system bus 23 may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. The system memory includes read-only memory (ROM) 24 and random
15 access memory (RAM) 25. A basic input/output system 26 (BIOS), containing the basic routines that help to transfer information between elements within the personal computer 20, such as during start-up, is stored in ROM 24. The personal computer 20 may further include a hard
20 disk drive 27 for reading from and writing to a hard disk, not shown, a magnetic disk drive 28 for reading from or writing to a removable magnetic disk 29, and an optical disk drive 30 for reading from or writing to a

removable optical disk 31 such as a CD-ROM or other optical media. The hard disk drive 27, magnetic disk drive 28, and optical disk drive 30 are connected to the system bus 23 by a hard disk drive interface 32, a magnetic disk drive interface 33, and an optical drive interface 34, respectively. The drives and their associated computer-readable media provide non-volatile storage of computer readable instructions, data structures, program modules and other data for the personal computer 20. Although the exemplary environment described herein employs a hard disk, a removable magnetic disk 29 and a removable optical disk 31, it should be appreciated by those skilled in the art that other types of computer readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, random access memories (RAMs), read-only memories (ROMs) and the like may also be used in the exemplary operating environment. Further, as used herein, the term "computer readable medium" includes one or more instances of a media type (e.g., one or more floppy disks, one or more CD-ROMs, etc.).

A number of program modules may be stored on

the hard disk, magnetic disk 29, optical disk 31, ROM 24 or RAM 25, including an operating system 35, one or more application programs 36, other program modules 37 and program data 38. A user may enter commands and
5 information into the personal computer 20 through input devices such as a keyboard 40 and pointing device 42. Other input devices (not shown) may include a microphone, joystick, game pad, satellite disk, scanner or the like. These and other input devices are often connected to the
10 processing unit 21 through a serial port interface 46 that is coupled to the system bus, but may be connected by other interfaces, such as a parallel port, game port or universal serial bus (USB). A monitor 47 or other type of display device is also connected to the system
15 bus 23 via an interface, such as a video adapter 48. In addition to the monitor 47, personal computers typically include other peripheral output devices (not shown), such as speakers and printers.

The personal computer 20 may operate in a
20 networked environment using logical connections to one or more remote computers, such as a remote computer 49. The remote computer 49 may be another personal computer, a server, a router, a network PC, a peer device or other

common network node, and typically includes many or all of the elements described above relative to the personal computer 20, although only a memory storage device 50 has been illustrated in Figure 1. The logical connections depicted in Figure 1 include a local area network (LAN) 51 and a wide area network (WAN) 52. Such networking environments are commonplace in offices, enterprise-wide computer networks, Intranets and the Internet.

When used in a LAN networking environment, the personal computer 20 is connected to the local network 51 through a network interface or adapter 53. When used in a WAN networking environment, the personal computer 20 typically includes a modem 54 or other means for establishing communications over the wide area network 52, such as the Internet. The modem 54, which may be internal or external, is connected to the system bus 23 via the serial port interface 46. In a networked environment, program modules depicted relative to the personal computer 20, or portions thereof, may be stored in the remote memory storage device. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

2. A Network Environment

Figure 2 illustrates an exemplary network environment in which the present invention may be employed. Of course, actual network environments can be arranged in a variety of configurations; however, the
5 exemplary environment shown here provides a framework for understanding the type of environment in which the present invention operates.

The network may include client computers 20a,
10 server computer 20b, and data source computers 20c. Client computers 20a and data source computers 20c are in electronic communication with the server computer 20b via communications network 80 which may be, for example, the Internet. Client computers 20a and data source computers
15 20c are connected to the communications network by way of communications interfaces 82. Client computers 20a, data source computers 20c, and server computers 20a are computing systems such as, for example, the computer system described above with reference to Figure 1.
20 Communications interfaces 82 can be any one of the well-known communications interfaces such as Ethernet connections, modem connections, and so on.

Server computer 20b comprises server software

that operates as described in detail below to control access to documents that are undergoing revision in a publishing workflow. The electronic documents that are under control of the server software may be located on
5 server computer 20b, client computer 20a, or data source 20c. Client computers 20a can access server computer 20b via communications network 80 to access documents which are being routed through a workflow and which are under control of server computer 20b.

10 As will be readily understood by those skilled in the art of computer network systems, and others, the system illustrated in FIGURE 2 is exemplary, and alternative configurations may also be used in accordance with the invention. For example, server computer 20b may
15 comprise a plurality of computing devices. Additionally, the client computer 20a and server computer 20b may be the same physical device. As discussed above, the client computer 20a and the server computer 20b may communicate through any type of communication network or
20 communications medium.

DETAILED DESCRIPTION OF SYSTEM AND METHOD FOR DOCUMENT
ISOLATION

Figure 3 is a diagram of software modules of server software 100 that operate on server computer 20b in accordance with aspects of the invention. As shown, server software 100 comprises distributed authoring and versioning (DAV) server 110, publishing engine 112, security manager 114, versioning manager 116, and store area 118.

Store area 118 operates as a repository for information objects such as folders, documents, and role memberships as defined on the folders and documents. If, upon receipt of a request for a document, the requesting user has the appropriate permissions, store area 118 is accessed in order to retrieve the requested document.

DAV server 110 receives requests formatted according to the DAV standard and forwards the requests to the appropriate system software component. DAV server is operable to field requests that are formatted to take advantage of the publishing capabilities of the system as well as those that do not.

Publishing engine 112 provides the capability to create and maintain workflows. When a document is placed in a workflow, publishing engine 112 provides for routing the document to the appropriate persons in the

workflow template.

Versioning manager 114 operates to create, maintain, and track versions of documents. During the period that a document is undergoing a publishing workflow, numerous versions of a document may be created. Versioning manager 114 controls the versioning during the publishing process.

Security manager 116 provides for the creation, maintenance, and enforcement of restrictions on performing publishing operations. Thus, when it is desired to create a new publishing operation and define which roles may have access to them, security manager 116 provides the needed functionality. Furthermore, when a request to perform a publishing operation is received, security manager 116 determines whether the particular user has been granted permissions to the operation.

Generally, workflow templates may be used in the publishing environment to insure that a new document or a revision to an existing document is subject to a standard review procedure before it becomes generally available. For example, a manager of a testing department may desire to establish a document publishing workflow through which all test-plan documents must pass

1 prior to being made generally available. During the
period that a new document or a revision to a document is
undergoing editing and approval in the workflow template,
those users that are not involved with the approval
5 process should have access to the base document while
those persons involved with the approval process should
be directed to the latest version of the revised
document. According to an aspect of the invention,
access to the base document as well as any versions that
10 may be created during a publishing workflow are
controlled by placing read/write security controls on the
documents. Similarly, permissions to perform a
publishing operation are identified through security
controls on the base document.

15 Figure 4 illustrates an exemplary publishing
workflow that may be implemented using systems and
methods in accordance with the present invention. The
workflow can be thought of as encompassing various stages
or "states" through which a document passes. According
20 to an aspect of the present invention, the version of the
document that a user may access as well as the operations
that the user may perform on a document while it is in a
particular "state" is limited by the role that a user has

been granted.

According to the publishing workflow template illustrated in Figure 4, initially a document can be thought of as existing in a "create" state 220. While a document is in create state 220, a user, who may be referred to as the document owner, can checkout and revise a document. As noted in Figure 4, while the document is in create state 220, users that have been assigned roles applicable to the workflow, which in this example include reviewer and approver roles, do not have privileges to perform specialized publication operations on the document. When a document is checked-out by the owner during create state 220, users other than the owner, referred to collectively as "public users," cannot view the checked-out version of the document. If a public user attempts to access the document while it is checked-out, the user is redirected to the version of the document that existed prior to the document having been checked-out.

While in create state 220, when the owner checks-in the document, a publishing workflow is invoked and the revised document enters "in-review" state 222. While a document is in in-review state 222, the document

owner as well as users that have been assigned the reviewer role may check-out the document for editing. In contrast, users that have been assigned the approver role may not check-out a document while it is in in-review
5 state 222. Public users may not even see the new document but rather will be referred to the version of the document that existed prior to the owner checking-out the document. When all of the users with the reviewer role have accessed the document, the document is
10 forwarded to "in-approval" state 226.

While a document is in "in-approval" state 226, users that have been assigned the approver role can check-out the document to review the document and, if appropriate, upon checking-in the document, acknowledge
15 their approval of the document. The document owner and users that have been assigned the reviewer role do not have the capability to check-out the document while it is in-approval state 226. Public users do not even see the revised document but rather are referred to the version
20 of the document that existed prior to the owner checking-out the document.

When all of the users with the approver role have accessed the document, the document leaves the

publishing workflow and enters "approved" state 228. In approved state 228, the public can access the revised and approved document. Users assigned the reviewer and approver roles have no special privileges once the

5 document has been approved and has left the publishing workflow. The approved document may, thereafter, enter the create state 220 upon being checked out and revised.

According to an aspect of the present invention, during the period that a document is in a

10 publishing workflow, the system maintains a working copy document corresponding to the base document. Several versions of the working copy document may be created over the course of the publishing workflow. Users are selectively directed to the appropriate version of the

15 document as specified by the workflow. Further, users are selectively granted the capability to perform publishing operations on the document undergoing a publishing workflow.

Generally, access to documents and publishing

20 operations that may be performed on those documents is controlled using security controls. For each base document there is defined a security descriptor and a publishing operation access control list (ACL).

Generally, the security descriptor defines who may read and write to the document. The security descriptor plays an essential part in identifying to which version of a document a user should be directed. In particular, users
5 are directed to the most recent version of a document to which they have been granted read access. For example, the security descriptors on a base document are evaluated in light of the publishing state the document is currently in and the user's role to determine if the user
10 has access to the document at all, and, if so, whether the user should be directed to the base document or whether the user should be directed to the working copy document. Thus, it is possible to identify that the general public have read access to a base document while
15 users that have been assigned the editor role are directed to the working copy document.

The security controls of the present invention further comprise a publishing operation access control list (ACL). Generally, the publishing operation ACL's,
20 which are described in detail below, are maintained for each base document. A publishing operation ACL defines the publishing operations that may be performed on the document, including working copies, by users that have

been assigned specific roles. Thus, upon receipt of a request to perform a publishing operation on a document, the requesting user's roles are evaluated against the publishing operation ACL that is associated with the base document. The requestor is permitted to perform publishing operations on the document to the extent his or her roles have been granted privileges to the document. For example, if a user is interested in performing a check-out operation, he or she issues a check-out command on the base document. The publishing operation ACL associated with the base document is referenced to determine whether the user's roles have been granted the privilege to check-out. If so, a new version of the working copy of the document is created and the access control list associated with the base document is modified to identify that only that particular user has privileges to perform a check-in operation.

Figure 5 is a table illustrating values for the security controls, including security descriptors and publishing operation ACL's, that are maintained for an exemplary document entitled "foo.doc" as the document moves through the various states in the publishing

workflow described above in connection with Figure 4. As shown, the table comprises the following columns:

role/user column 510 which identifies a user or role;

file column 512 which identifies the name of a file to

5 which the user or role of column 510 has access;

publishing operation column 514 which corresponds to the publishing operation ACL on the base document and which identifies the publishing operation, if any, that the role or user of column 510 may perform on the file of

10 column 512; read write column 516 which corresponds to information contained in the security descriptor for the document identified in column 512 and which identifies whether the user or role identified in column 510 has read or write privileges to the file identified in column

15 512; public folder column 518 which identifies that the file listed therein may be accessed by the general public; working folder column 520 which identifies that the file listed therein resulted from the operation of the publishing workflow and access to the document is

20 restricted; and operation performed column 522 which identifies the operations that are performed as a document progresses through a document publishing workflow. The various states (create 220, in-review 222,

in-approve 224, and approved 228) that are represented in Figure 4 are similarly identified in Figure 5.

As shown, in create state 220, the document foo.doc is generally accessible to the public, as
5 designated in column 516, and may be checked-out by members of the public to revise the document, as designated in column 514. If a check-out operation is performed by a member of the public, a new working copy document, foo_1.doc, is created and maintained separate
10 from the base document foo.doc. The user that checks-out the document is considered to be the "owner" of the document. The security descriptor associated with foo_1.doc is set to indicate, as reflected in column 516, that the owner has read and write privileges. It should
15 be noted that members of the public do not have access to the new working copy of the document foo_1.doc and in fact, do not have access to any of the subsequent versions until the publishing workflow is complete. Indeed, public users that are not involved with the
20 publishing workflow are directed to foo.doc until the workflow is complete and a new public document is created. The publishing operation ACL associated with the base document, foo.doc, is updated, as reflected in

column 514, to indicate that the owner may perform a check-in operation.

When the owner performs the check-in operation, the "in-review" state of the publishing workflow template is entered and a new version of the working copy document
5 entitled foo_2.doc is created. The security descriptor associated with foo_2.doc is created, as reflected in column 516, to identify that the document owner and those users with the reviewer role may view the newly created
10 foo_2.doc. The public, however, continues to be directed to foo.doc and does not even see foo_2.doc. Further, as represented in column 514, the publishing operation ACL associated with the base document, foo.doc, is updated to indicate that the owner and users assigned the reviewer
15 role have permissions to perform check-out operations.

When a user with the reviewer role performs a check-out operation on foo_2.doc, a new version of working copy document, foo_2wc.doc, is created. The security descriptor associated with foo_2wc.doc is
20 updated, as reflected in column 516, to identify that the reviewer who checked out foo_2.doc has read and write privileges to foo_2wc.doc. Accordingly, when the reviewer accesses foo.doc, he or she is directed to foo_2wc.doc.

The document owner meanwhile, continues to be directed to
foo_2.doc. Further, as represented in column 514, the
publishing operation ACL associated with the base
document, foo.doc, is updated to indicate that the
5 reviewer has permissions to perform check-in operations
while the owner has no permissions.

When the reviewer has finished editing
foo_2wc.doc and performs a check-in operation, in-approve
state 226 is entered and a new document, foo_3.doc, is
10 created. The security descriptor related to foo_3.doc
identifies that the owner, users with the reviewer role,
and users with the approver role may view the new
document. Accordingly, if the owner or users with either
the reviewer or approver role were to request access to
15 foo.doc, they will be directed to foo_3.doc. The
publishing operation ACL associated with base document,
foo.doc, is updated to indicate that users with the
approver role may perform a check-out operation. Users
with the reviewer role no longer have permissions to
20 perform check-in operations.

When a user with the approve role performs a
check-out operation on foo_3.doc, a new version of the
working copy document, foo_3wc.doc, is created. As

reflected in column 516, the approver who checked out the document has permissions to read and write to foo_3wc.doc and will automatically be routed to that version when he or she accesses foo.doc. The security descriptors

5 indicate that the document owner and users with the reviewer role may access foo_3.doc but not foo_3wc.doc. As designated in column 514, the publishing operation ACL associated with the base document indicates that the user with the approver role that checked out the document has

10 permissions to perform a check-in operation. The document owner and users with the reviewer role do not have permissions to perform publishing operations.

As shown, when the user with the approver role performs a check-in, or approve operation, the publishing

15 workflow is complete and approved state 228 is entered. Upon the check-in operation being performed, a new version of the document, foo_4.doc, is created. Indeed, in a preferred embodiment, the base document is overwritten by foo_4.doc. As indicated in column 516,

20 foo_4.doc is available to the public. This is in contrast to the situation at the beginning of the workflow wherein the public is directed to the document foo.doc.

As the preceding example illustrates, during the period that a document is undergoing revision in a publishing workflow, a separate copy of the base document, the working copy document, is maintained.

5 Thus, the base document is isolated from the several versions of the working copy document that are created. Security controls are placed on the base document to identify which document a user may access as well as to identify the operations users may perform on those
10 documents. Specifically, security descriptors are defined for each document and identify which users have read and write access to the documents. The security descriptor information is used to resolve which document, either base or working copy, a user is directed to upon
15 receipt of a request to access the document. Furthermore, publishing operation ACL's are defined for each base document and identify which publishing operations, for example, check-out and check-in, a user may perform.

20 Figure 6 is a flow diagram of a process for handling user requests to access a document. As shown, at step 610, a request to view a document is received. At step 612, the security descriptor on the base document

is evaluated to determine whether the user or the user's role has read access to the document. If not, at step 614 the user is denied access to the document. At step 616 the security descriptor on the base document is
5 evaluated in light of the user's role and the publishing state in which the document is located to determine if the user should be directed to the base document or the working copy document. If the user or user's role should not have access to the working copy as defined by the
10 publishing model state, at step 618, the base document is returned to the user. If the user or user's role should have access to the working copy as defined by the publishing model state in which the document is located, at step 620, the most recent version of the working copy
15 document is returned to the user.

Figure 7 provides an overview of the process for handling user requests to perform a publishing operation on a document undergoing revision in a document workflow. As shown, at step 710, a request is received
20 to perform a publishing operation such as, for example a check-out operation. At step 712, it is resolved whether the user has permission to perform the requested operation on the document. The process for making this

determination is described below in detail with reference to Figure 8. Generally, however, the resolution is made by comparing the requesting user's roles with the publishing operation ACL stored in relation with the base
5 document.

If at step 712, it is determined that the user does not have permissions to perform the desired operation, at step 714, permission is denied. If however, the user does have permission, at step 716 a new
10 working copy of the document is created. The security descriptor for the new document is created so as to designate that the appropriate parties have access to the document. For example, if the user is performing a check-out operation, which causes a new working copy
15 document to be generated, the security descriptor identifies that the party checking out the document has read and write privileges to the document. At step 718, the publishing operation ACL on the base document is updated to correspond to the changed status of the
20 document. For example, if the user has requested to check-out the document and a new working copy of the document has been created, the publishing operation ACL associated with the base document is updated to indicated

that only the user who has checked out the document has permissions to perform a check-in operation on the document. Thereafter, at step 720, the user is given access to the document and the means to perform the
5 requested operation.

Figure 8 provides a flow chart illustrating the process for resolving whether a user should be granted permission to perform a publishing operation on a document. As shown, at step 810, the roles that have
10 been assigned to the user are identified. At step 812, the set of roles that have been assigned to the user are compared to the list of role privileges within the publishing operation ACL that is associated with the base document. If at step 814, one or more of the user's
15 assigned roles have been granted permission to perform the desired operation, at step 816, it is resolved to grant permission to perform the operation. If at step 814, however, none of the user's assigned roles have been granted permission to perform the desired operation, at
20 step 818, it is resolved to deny permission to perform the operation.

As illustrated by the flow diagrams of Figures 6, 7, and 8, access to documents and document publishing

operations is controlled through the security descriptors and publishing operation ACL's that are maintained by the system. Security descriptors identify the users that have read and write access to the document. The
5 publishing operation ACL's identify the publishing operations that users may perform.

Figure 9 provides an illustrative example of the component parts of a security descriptor for use in the present invention. As shown, a security descriptor
10 comprises owner identifier 910 and a discretionary access control list (DACL) 912. Owner identifier 910 identifies the user who created the document. DACL 912 comprises a series of structures, which might be referred to as access control entry (ACE) structures, wherein each
15 structure comprises an access allowed/denied identifier 914, and a security identifier (SID) 916. SID 916 uniquely identifies a user or role. Access allowed/denied identifier 914 specifies whether the user or role identified by SID 916 has read or write access to
20 the particular document. As shown, DACL 912 may comprise a plurality of entries.

As described above in relation to Figure 5, the documents which a user has permission to access changes

as a document proceeds through a workflow. The security descriptors related to the documents are modified as appropriate to institute and enforce these changes.

Further, when a request is received to access a document,
5 the appropriate document to which the user should be directed is resolved using the security descriptors.

Figure 10 provides an illustrative example of the component parts of a publishing operation ACL for use in the present invention. As shown, a publishing
10 operation ACL comprises a list of structures 1010, wherein each structure comprises a global level unique identifier (GUID) 1012, a unique security identifier (SID) 1014, and an access allowed/denied identifier 1016. In one embodiment, structures 1010 may be referred to as
15 ACE's, although the ACE's have been extended from those defined for DACL's 912. GUID 1012 identifies a publishing operation and SID 1014 identifies a role or user that has access to the publishing operation identified by GUID 1012. In one embodiment, GUID 1012 is
20 a one-to-one mapping with a unique 128 bit number and an associated operation.

As described above in relation to Figure 5, as a document proceeds through a workflow, the operations

that a user or role can perform on the document change.
Publishing operation ACL's are modified as appropriate to
institute and enforce these changes. Further, upon
receipt of a request to perform a publishing operation,
5 the publishing operation ACL's are referenced to
determine whether to permit or deny access to the
requested operation.

According to an aspect of the invention, the
systems and methods are extensible to accommodate new
10 user-defined publishing workflows, new user-defined
publishing operations, and new user-defined roles. Thus,
when a new publishing operation is created, it is
assigned a new GUID 1012. Similarly, when a new role is
created, it is assigned a new SID 1014. User-defined
15 GUID's and SID's may be added to a publishing operation
ACL to enforce the restrictions instituted in a new
workflow template as described above.

Thus, the present invention provides systems
and methods for providing document isolation in a
20 workflow environment. According to an aspect of the
invention, when a revision is made to a document and the
revision placed in a publishing workflow, a separate
"working" copy of the original or "base" document is

generated. As the document moves through the workflow,
new versions of the "working" copy document may also be
generated. Security controls, which define who may
access the original document as well as any versions of
5 the working copy document, are defined and stored in
relation to the documents. The security controls
further define the types of actions users may take with
respect to the document. Thus, the invention provides
for systems and methods that reliably control access to
10 documents and that are extensible to accommodate user-
defined workflows. These aspects of the invention
provide that the base document may be made available to
users to view, even while a revision of the document is
being approved in a publishing workflow.

15 Those skilled in the art understand that
computer readable instructions for performing the above
described processes can be generated and stored on a
computer readable medium such as a magnetic disk or CD-
ROM. Further, a computer such as that described with
20 reference to Figure 1 may be arranged with other
similarly equipped computers in a network, and each
computer may be loaded with computer readable
instructions for performing the above described

processes. Specifically, referring to Figure 1, microprocessor 21 may be programmed to operate in accordance with the above-described processes.

While the invention has been described and illustrated with reference to specific embodiments, those skilled in the art will recognize that modification and variations may be made without departing from the principles of the invention as described above and set forth in the following claims. In particular, while the invention has been described with respect to limiting access to documents, the invention may be employed to control access to virtually any type of data object including folders. Further, while the invention has been described in the context of a publishing environment, the inventions may apply to other environments as well. Accordingly, reference should be made to the appended claims as indicating the scope of the invention.

CLAIMS

What is claimed is:

1. A computer-implemented method for controlling access to documents during a workflow, comprising:

5 upon entry of a base document into a workflow, creating a working copy of the base document;

selectively providing a user access to either the base document or the working copy of the base document depending upon the identity of a user; and

10 selectively providing access to perform operations on the working copy of the base document depending upon the identity of a user.

2. The method of claim 1, further comprising:

15 storing access control list data in relation to the base document, the access control list data defining access controls on performing operations of the working copy of the base document; and

storing security descriptor data in relation to
20 the base document and the working copy of the base

document, the security descriptor data defining access controls on reading the base document and the working copy of the base document.

5 3. The method of claim 2, wherein the step of selectively providing access to perform operations on the working copy of the base document depending upon the identity of a user, further comprises:

10 determining using the access control list data stored in relation to the base document that a user has permission to perform an operation on the copy of the base document; and

allowing the user to perform the operation on the copy of the base document.

15

4. The method of claim 2, wherein the step of selectively providing access to perform operations on the working copy of the base document depending upon the identity of a user, further comprises:

20 determining using the access control list data stored in relation to the base document that a user does

not have permission to perform an operation on the copy of the base document; and

denying the user access to perform the operation on the copy of the base document.

5

5. The method of claim 2, wherein the access control list data comprises information identifying for each of a plurality of operations, the set of users that have permission to perform the operation, and said act of
10 selectively providing access to perform operations on the working copy of the base document depending upon the identity of a user, further comprises:

referencing the information identifying for each of a plurality of operations, the set of users that have
15 permission to perform the operation; and

if the user is in the set of users that have permission to perform the operation, providing access to the operation.

20 6. The method of claim 2, wherein the access control list data comprises information identifying for each of a plurality of operations, the set of users that have

permission to perform the operation, and said act of selectively providing access to perform operations on the working copy of the base document depending upon the identity of a user, further comprises:

5 referencing the information identifying for each of a plurality of operations, the set of users that have permission to perform the operation; and

 if the user is not in the set of users that have permission to perform the operation, denying access to the
10 operation.

7. The method of claim 5, wherein the set of users are defined in terms of the roles that have permission to perform the operation, and said act of referencing the
15 information identifying for each of a plurality of operations, the set of users that have permission to perform the operation, further comprises:

 resolving for the user the set of roles to which the user has been assigned; and

20 determining using the set of roles to which the user has been assigned and the set of users defined in terms of the roles that have permission to perform the

operation, whether the user has permission to perform the requested operation.

8. The method of claim 2, wherein the step of
5 selectively providing a user access to either the base document or the working copy of the base document depending upon the identity of a user, further comprises:

determining using the security descriptor data stored in relation to the base document and the working
10 copy document, that a user has permission to read the working copy of the base document; and

providing the user access to the working copy of the base document.

15 9. The method of claim 2, wherein the step of selectively providing a user access to either the base document or the working copy of the base document depending upon the identity of a user, further comprises:

determining using the security descriptor data
20 stored in relation to the base document and the working copy document, that a user does not have permission to read the working copy of the base document; and

denying the user access to the base document.

10. The method of claim 2, wherein the security descriptor data comprises information identifying the set of users that have permission to read each of the base document and the working copy of the base document, and said act of selectively providing access to either the base document or the working copy of the base documents depending on the identity of the user, further comprises:
- 10 referencing the information identifying the set of users that have permission to read each of the base document and the working copy of the base document; and
- if the user is in the set of users that have permission to read the working copy of the base document,
- 15 providing access to the working copy of the base document.

11. The method of claim 10, wherein the set of users are defined in terms of the roles that have permission to read each of the base document and the working copy of the base document, and said act of referencing the information identifying the set of users that have permission to read
- 20

each of the base document and the working copy of the base document, further comprises:

resolving for the user the set of roles to which the user has been assigned; and

5 determining using the set of roles to which the user has been assigned and the set of user defined in terms of the roles that have permission to read each of the base document and the working copy of the base document, whether the user has permission to read the base document or the
10 working copy of the base document.

12. A computer-readable media having stored thereon computer-executable instructions for performing the steps recited in claim 1.

15

13. A system for providing document isolation in a workflow environment, comprising:

a processor, wherein said processor is operable to execute instructions for performing the following acts:

20 maintaining for a base document undergoing a publishing workflow, a copy of the base document;

maintaining access control data in relation to
the base document and the copy of the base document; and

determining based on the access control data,
whether a user may access the base document or the copy of
5 the base document.

14. The system of claim 13, wherein the access
control data comprises security descriptor data identifying
the set of users that have permission to read the base
10 document and the copy of the base document.

15. The system of claim 14, wherein said processor is
operable to execute instructions for performing the
following further acts:

15 referencing the security descriptor data; and
determining that a user should be directed to the
copy of the base document based on the security descriptor
data.

20 16. The system of claim 15, wherein the security
descriptor data identifies a set of roles corresponding to
the set of users that have permission to read the base

document and the copy of the base document, and wherein said processor is operable to execute instructions for performing the further act of determining the set of roles that a user has been assigned.

5

17. The system of claim 13, wherein the access control data comprises access control list data identifying the set of users that have permission to perform operations on the copy of the base document.

10

18. The system of claim 17, wherein said processor is operable to execute instructions for performing the following further acts:

referencing the access control list data; and

15

determining that a user should be allowed to perform an operation on the copy of the base document based on the access control list data.

19. The system of claim 18, wherein the access control list data identifies a set of roles corresponding to the set of users that have permission to perform operations on the copy of the base document, and wherein

20

said processor is operable to execute instructions for performing the further act of determining the set of roles that a user has been assigned.

5 20. A method of updating access controls to reflect the addition of a new operation that may be performed on a copy of a base document, in a system wherein access to operations to be performed on a copy of the base document are controled using an access control list which identifies
10 the operations that may be performed and the roles that a user must have to access those operations, comprising:

assigning a unique identifier to the new operation;

updating the access control list to include an
15 entry for the unique identifier for the new operation;

updating the access control list to include an entry identifying the roles that have access to the new operation.

ABSTRACT OF THE INVENTION

A computer based system and method of providing document isolation during routing of a document through a workflow is disclosed. The method comprises maintaining
5 a separate "working" copy of the original base document while the document is routed through a workflow. Access controls, which define who may access the original document as well as any versions of the working copy document, are defined and stored in relation to the
10 documents. The access controls further define the types of actions users may take with respect to the document. Users are selectively directed to the appropriate document, either the base document or working copy, and selectively granted permission to perform publishing
15 operations on the working copy document, as determined by the access controls.

Computer 20

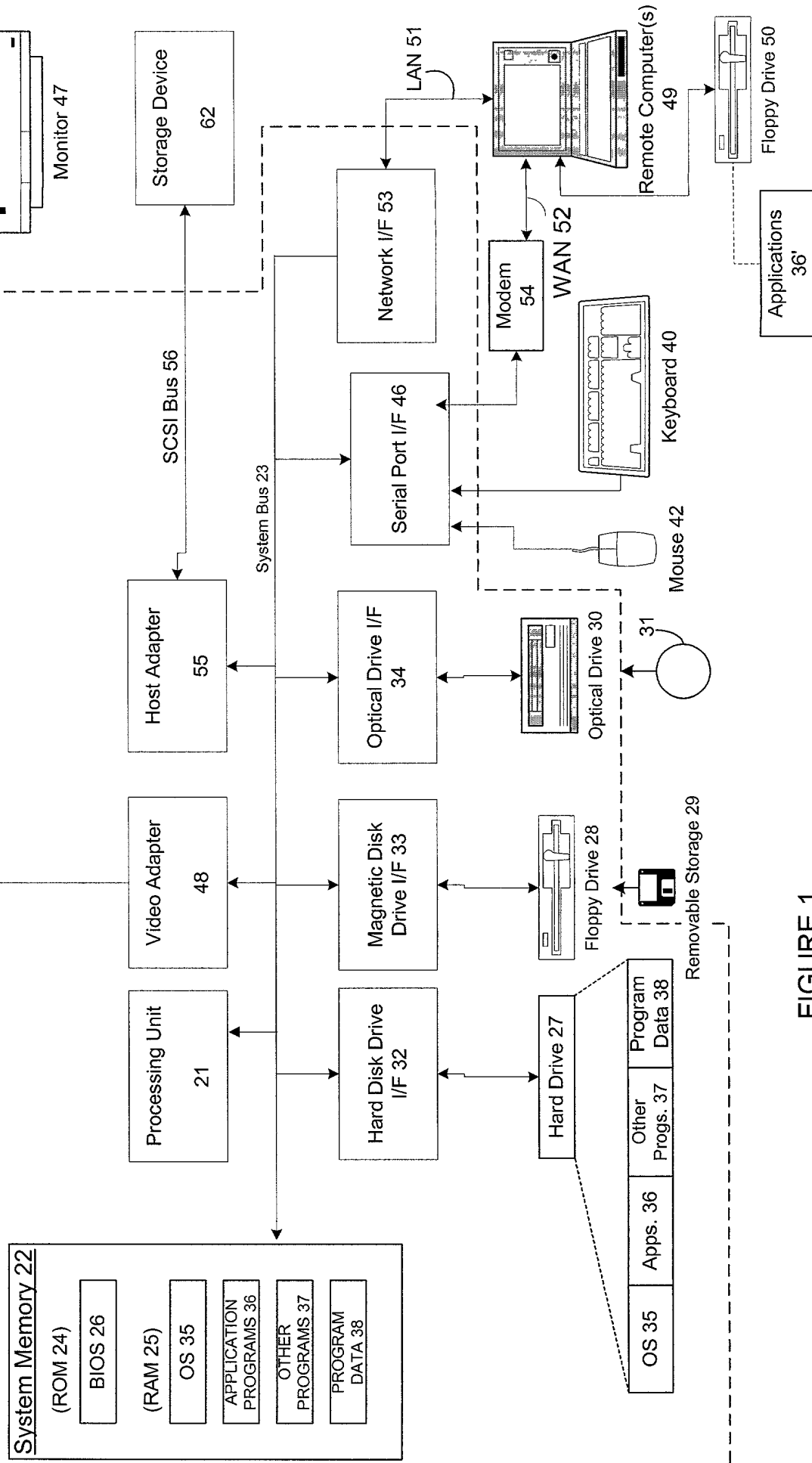


FIGURE 1

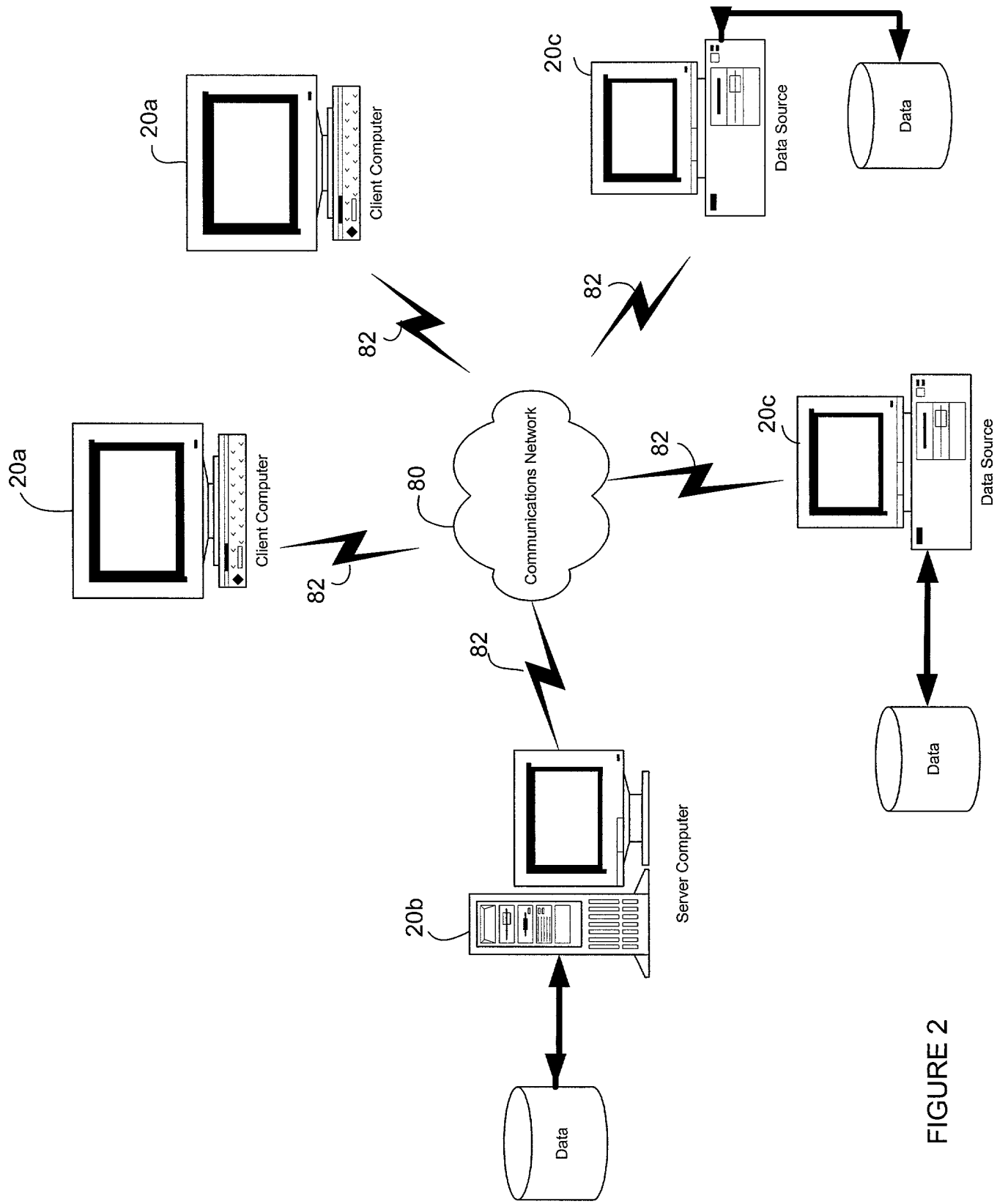
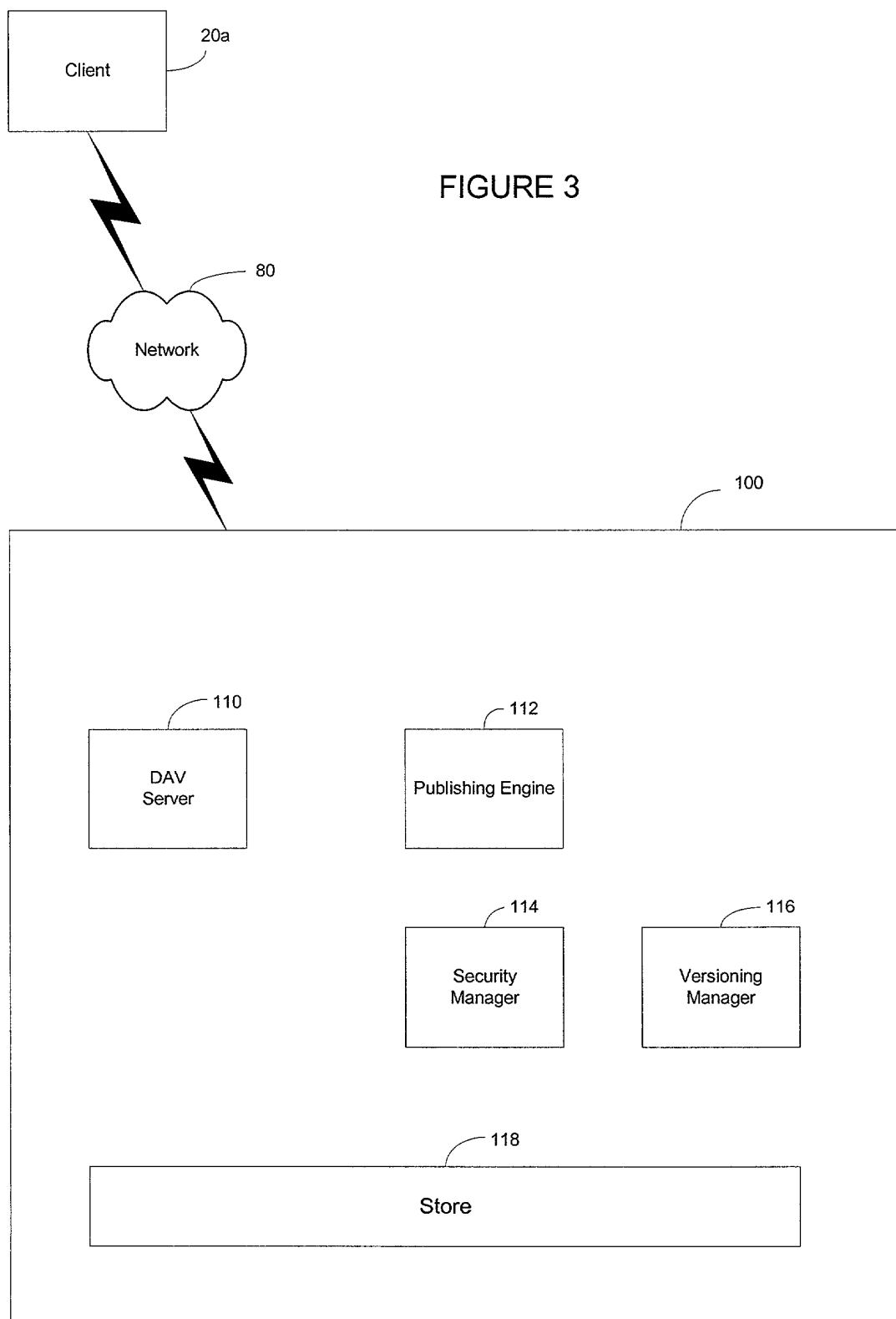


FIGURE 2



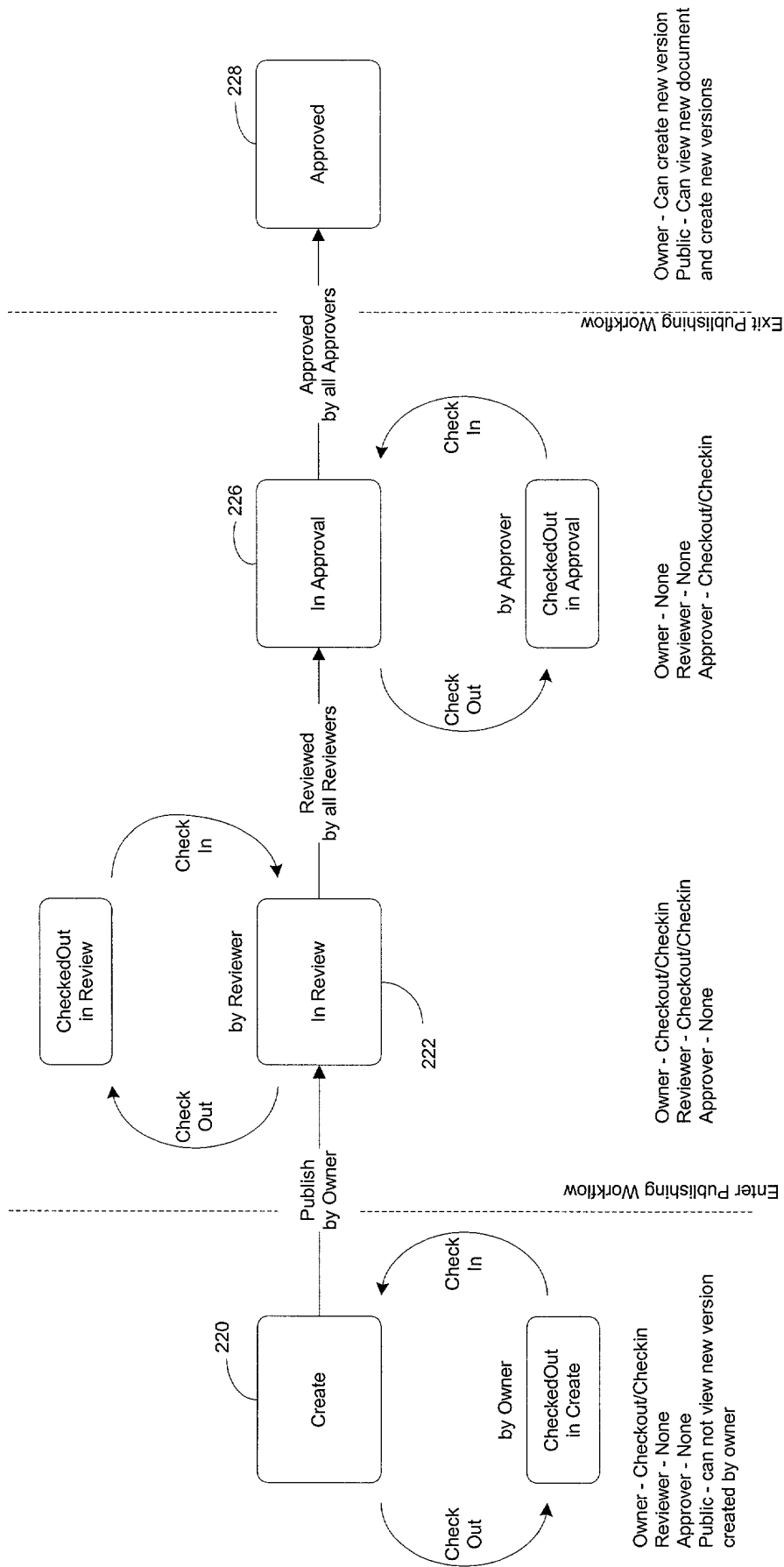


FIGURE 4

220	Create	510	512	514	516
		Role/User	File	Operation (ACL)	R/W (SD)
222	In-Review	Public	foo.doc	Create C/O	R
		Public Owner	foo_1	Create/Publish C/I	R R/W
226	In-Approve	Public Owner Reviewer	foo.doc foo_2 foo_2	Review C/O Review C/O	R R R
		Public Owner Reviewer	foo.doc foo_2 foo_2wc	Review C/I	R R R/W
228	Approved	Public Owner Reviewer Approver	foo.doc foo_3 foo_3 foor_3	Approve C/O	R R R R
		Public Owner Reviewer Approver	foo.doc foo_3 foo_3 foor_3wc	Approve C/I	R R R R/W
228	Approved	Public	foo4.doc	Create C/O	R
		Public	foo4.doc	Create C/O	R

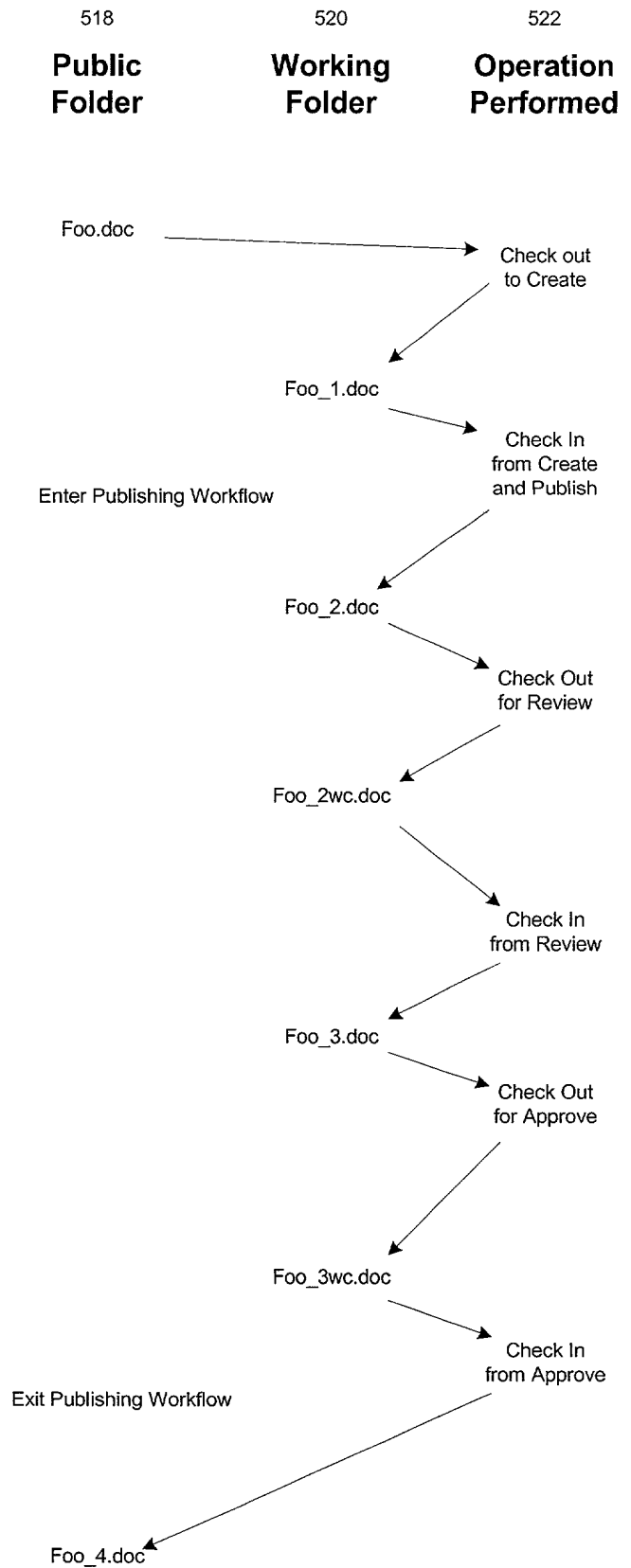


FIGURE 5

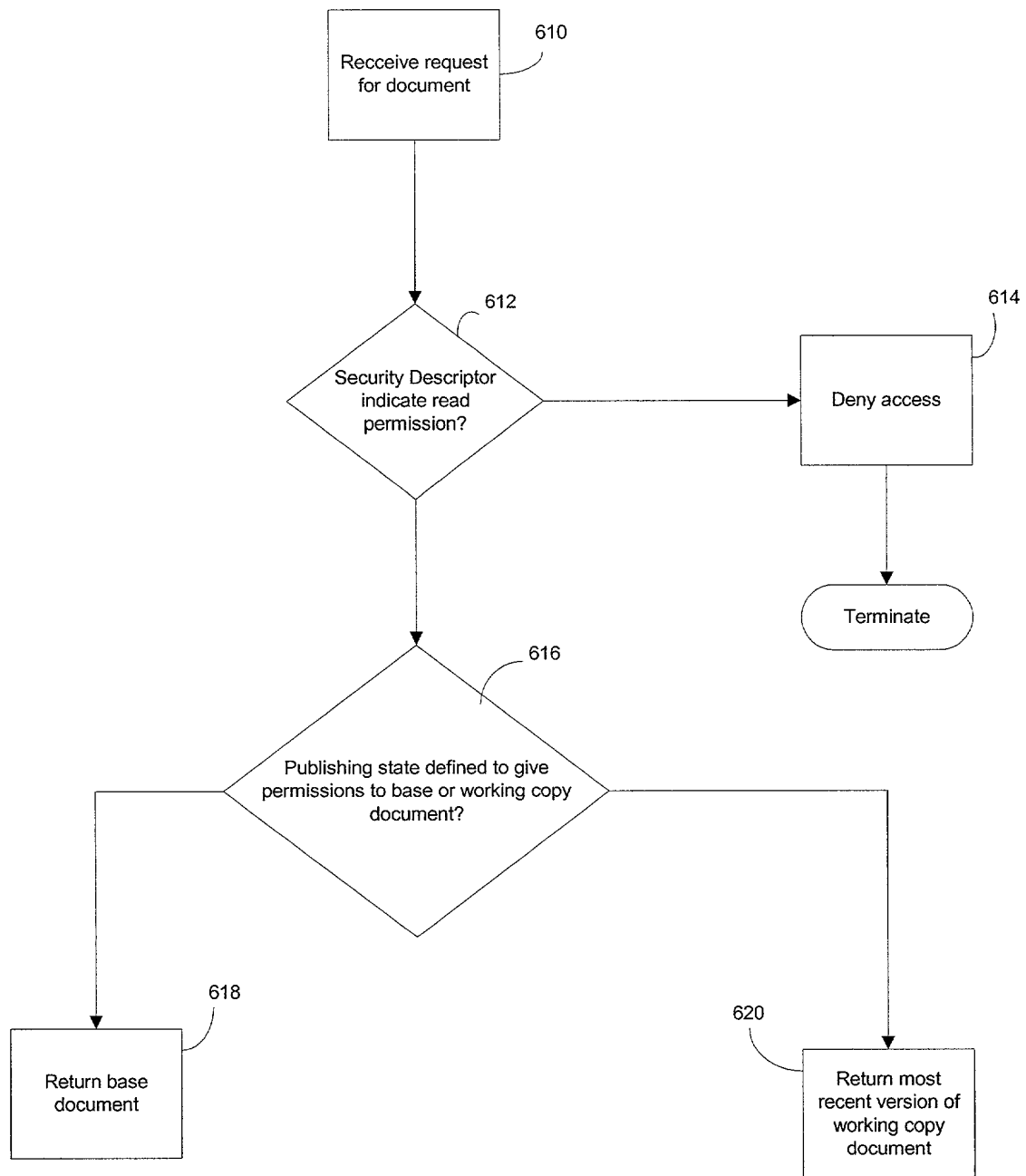


FIGURE 6

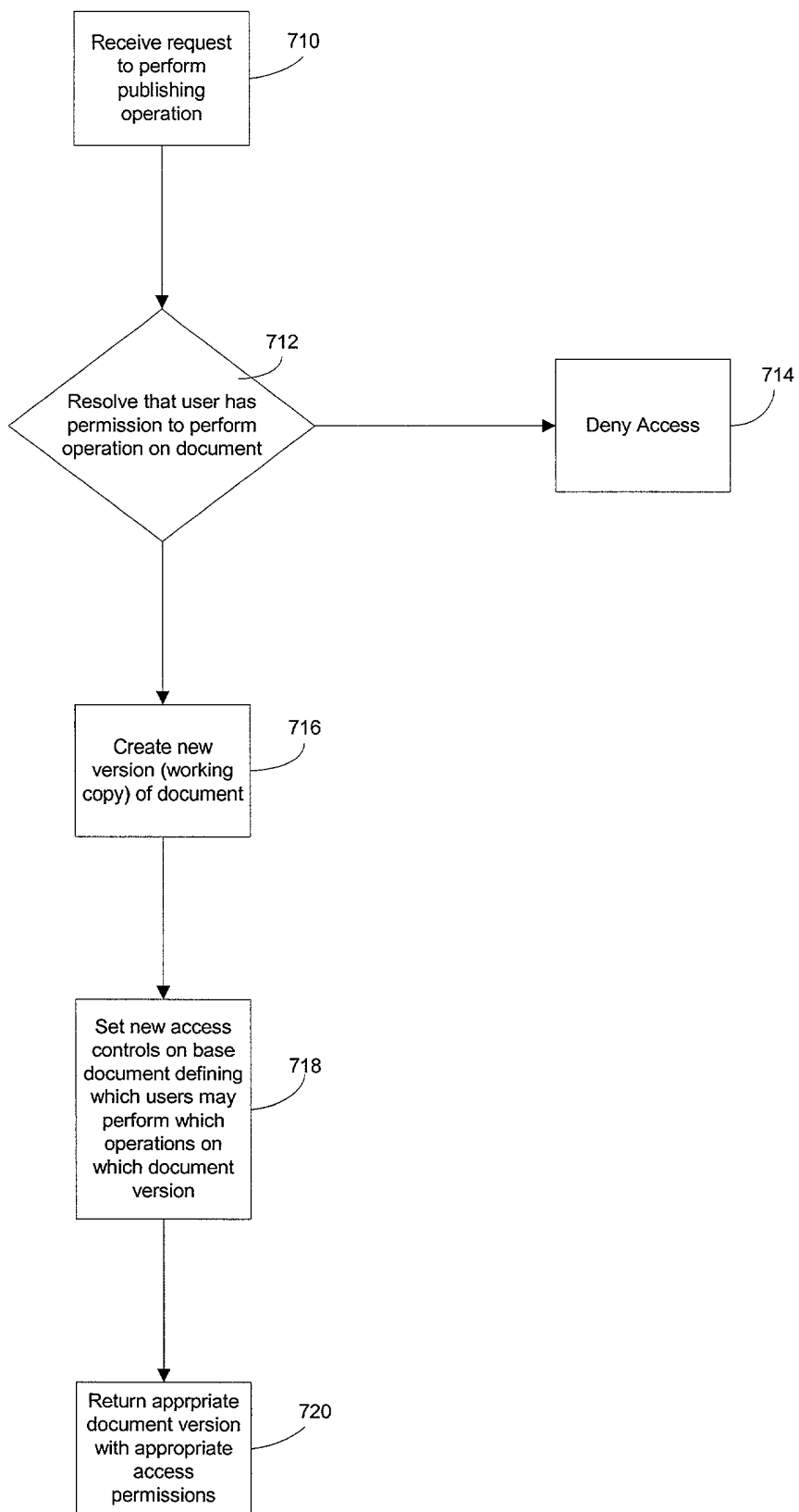


FIGURE 7

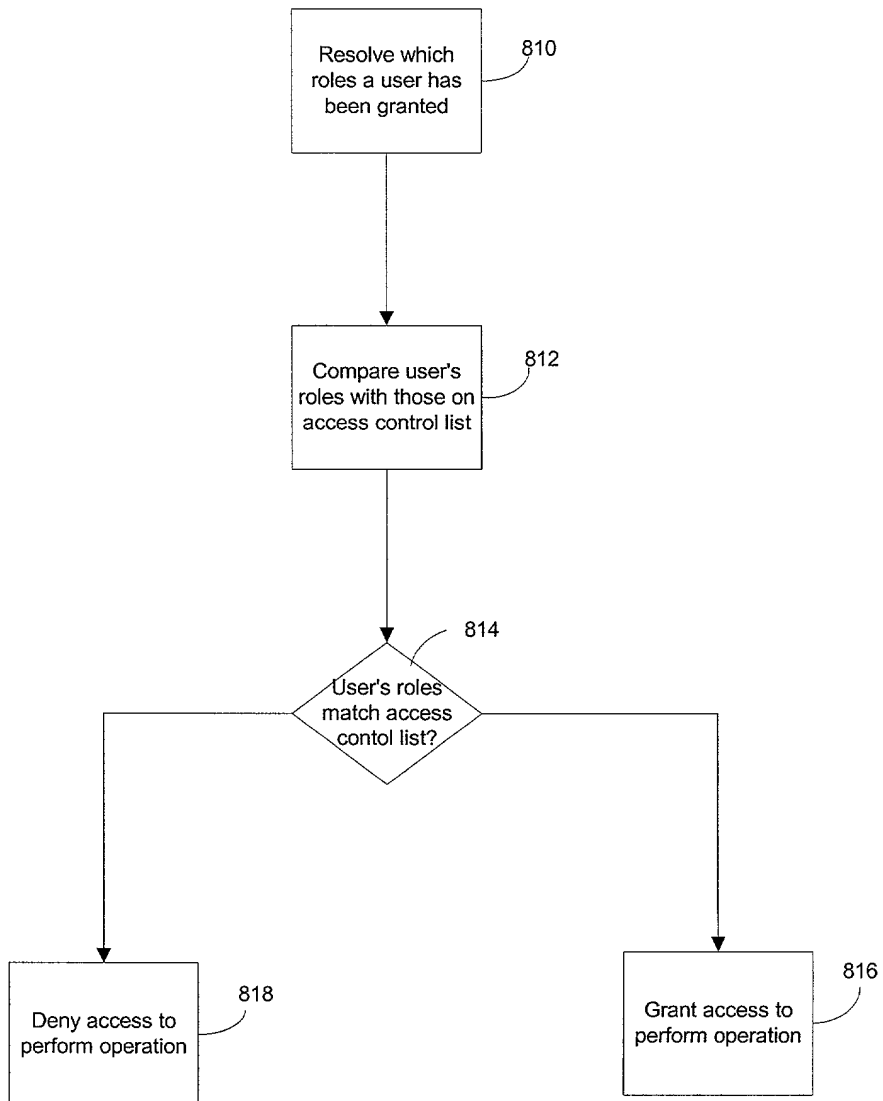


FIGURE 8

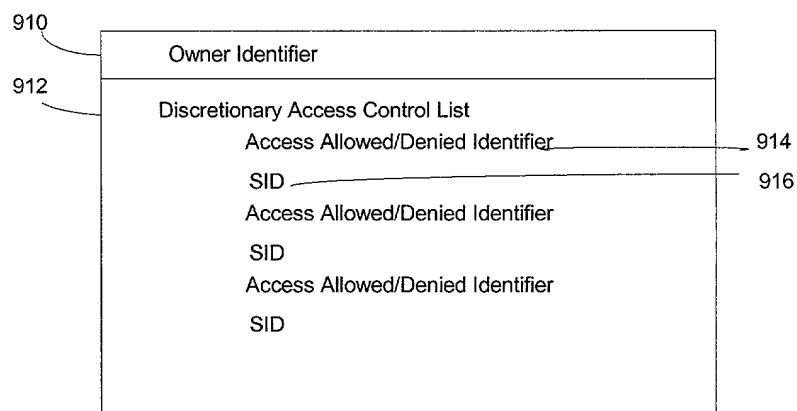


FIGURE 9

1012
1014
1016

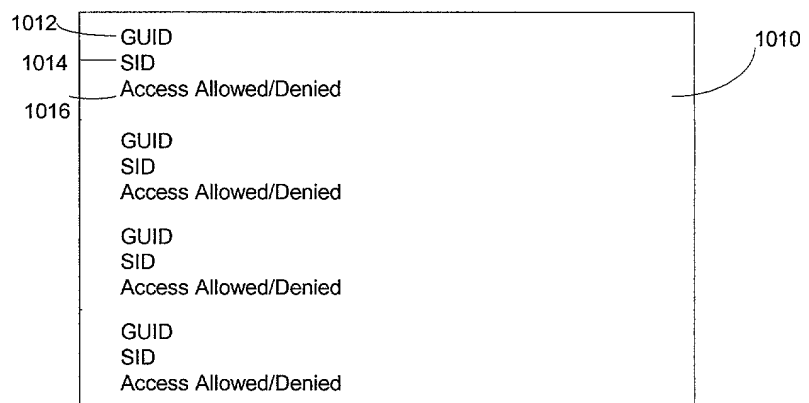


FIGURE 10

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Tanmoy Dutta, Alexander Balikov,
Himani Naresh

Group Art Unit: Not Yet Assigned

Examiner: Not Yet Assigned

For: SYSTEM AND METHOD FOR DOCUMENT ISOLATION

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;
and

I believe that I am the original, first and sole inventor (if only one name is listed below)
or an original, first and joint inventor (if plural names are listed below) of the subject
matter which is claimed and for which a

☒ Utility Patent☐ Design Patent

is sought on the invention, whose title appears above, the specification of which:

☒ is attached hereto.☐ was filed on _____ as Serial No. _____.☐ said application having been amended on _____.

I hereby state that I have reviewed and understand the contents of the above-identified
specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all
information known to be material to the patentability of this application in accordance
with 37 C.F.R. §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a-d) of any **foreign
application(s)** for patent or inventor's certificate listed below and have also identified
below any foreign application for patent or inventor's certificate having a filing date
before that of any application on which priority is claimed.

Priority Claimed (If X'd)	Country	Serial Number	Date Filed
<u>None</u>	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

I hereby claim the benefit under 35 U.S.C. §120 of any **United States application(s)** listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to be material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Serial Number	Date Filed	Patented/Pending/Abandoned
<u>None</u>	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States **provisional application(s)** listed below:

Serial Number	Date Filed
<u>None</u>	_____
_____	_____

I hereby appoint the following persons as attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Mailing Address: 23224 NE 21 st Place	Date of Signature: <u>28 JUNE 2000</u>
City/State of Actual Residence Redmond, WA 98053	Citizenship: <u>U.S.A.</u>

Name: Alexander Balikov	Signature: <u>Balikov</u>
Mailing Address: 3842 167 th Place NE, Apt. K2032	Date of Signature: <u>6/28/00</u>
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Name: Himani Naresh	Signature: <u>Himani Naresh</u>
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6/28/00 6/28/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Tanmoy Dutta, Alexander Balikov,
Himani Naresh

Group Art Unit: Not Yet Assigned

Serial No.: Not Yet Assigned

Examiner: Not Yet Assigned

Filed: Herewith

For: SYSTEM AND METHOD FOR
DOCUMENT ISOLATION

Assistant Commissioner for Patents
Washington DC 20231

Sir:

ASSOCIATE POWER OF ATTORNEY

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his/her associates with full power to prosecute the above-identified application and to transact all business in the Patent Office connected therewith and requests that correspondence continue to be directed to the firm of WOODCOCK WASHBURN KURTZ MACKIEWICZ & NORRIS LLP at the above address.

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